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CHILE AIR NAVIGATION TECHNOLOGIES PROJECT

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For more information on this project, possible financing options and export opportunities in Chile, contact:

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Overview

The Chile Air Navigation Technologies Project is designed to make more efficient use of Chile's national airspace by installing a Ground Based Augmentation System (GBAS) and a surveillance component, Automatic Dependent Surveillance-Broadcast (ADS-B).

These systems will be able to monitor air traffic with accurate precision, thus reducing the separation of aircraft, and will provide additional coverage in remote and mountainous terrain where there is no radar coverage or where radar coverage is limited.

The implementation of the project will have positive impacts on the environment by reducing fuel and noise emissions.

The study addressed two very different technologies and their use: the navigation component GBAS and the surveillance component ADS-B.

Project Description

This project deals with two very different technologies and their use: the navigation component GBAS and the surveillance component ADS-B.

ADS-B is a cooperative surveillance technique for air traffic control and related applications. An ADS-B-equipped aircraft determines its own position using a global navigation satellite system and periodically broadcasts this position and other relevant information to potential ground stations and other aircraft with ADS-B-in equipment. ADS-B can be used over several different data link technologies, including Mode-S Extended Squitter (1090 ES), VHF data link (VDL Mode 4), and Universal Access Transceivers (UAT). ADS-B is effective in remote areas or in mountainous terrain where there is no radar coverage, or where radar coverage is limited.

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GBAS has the capability to provide increased capacity and can replace aging navigation systems that are expensive to maintain:

- One GBAS can cover multiple runway ends
- More flexible than ILS
  - One GBAS can broadcast 26 unique approaches covering multiple runways at an airport, while ILS covers only one end of one runway, requiring additional installations for complete coverage
- Procedures uplinked from airport (DGAC-controlled), meaning no aircraft database concerns
- Eliminates capacity constraint due to ILS critical areas
- Save taxi-time per flight by not having to hold-short at critical areas
- Increases efficiency of arrival and departure operations and improves usage of runway capacity
- Improves access to airports during extremely low visibility operations
- Supports off-set landing thresholds
- Variable glidepath capability supports wake turbulence mitigation
- Aids in the transition to more advanced navigation capability
- High precision and high integrity terminal area navigation services
- Continuous descent approaches (CDAs) and curved-segmented approaches in extremely low visibility conditions
- Supports fuel efficiency and noise abatement initiatives

Status and Implementation

The project is expected to begin sometime in 2013. The DGAC identified 12 Chilean airports as potential GBAS candidate airports during the data collection effort. DGAC performed map and paper studies and site visits, conducted interviews and reviewed operational data provided by the DGAC. To evaluate and recommend the most appropriate technologies for the implementation of the LAAS systems at each of the airports, the operational environment, airspace architecture, weather conditions and user capabilities were researched and reviewed.

Of the 12 selected airports, 8 are technically suitable; however, looking at the operational environment (weather, traffic, forecast, user community), GBAS installations are only recommended for 6 locations. From a pure cost-benefit perspective, only 3 of these airports qualify for GBAS installations.

The GBAS study activities enticed LAN Chile, Chile's largest air carrier, to look into the GBAS technology and LAN is now considering ordering new aircraft with the GBAS option. LAN Chile and DGAC representatives are participating in the International GBAS Working Group, which is co-chaired by EUROCONTROL and the FAA.

GBAS installation can be economically viable and operationally acceptable on a local basis for an increasing number of airports and airspace users based on progressive developments over the next few years. GBAS Cat I stations are considered to be an interim step towards the development of GBAS Cat II/III stations. As such, it is recognized that there will not be a rapid transition from ILS to GBAS and that an ILS network may have to be maintained for the foreseeable future. However, ILS systems are facing some problems in terms of multi-path effects, dimension of the sensitive areas and radio spectrum constraints that are becoming progressively more critical.

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ISI used a GNSS Performance Monitoring System (GPMS) to provide a means for monitoring, analyzing, and distributing aeronautical information pertaining to Global Positioning System performance in accordance with the International Civil Aviation Organization (ICAO) directives. GPMS was reviewed under the GBAS implementation section to review potential synergies between GBAS installation and GPMS

directives. GPMS was reviewed under the GBAS implementation section to review potential synergies between GBAS installation and GPMS installation (common use of cabinet, antenna feed).

Based on this analysis, it was determined that several of the Flight Information Regions (FIRs) needed upgrades in communications, weather, and surveillance at varying altitudes. Based on the airspace analysis conducted on the existing radars above, there are significant coverage gaps at the following altitudes: 500, 1,000, 2,000, 5,000, and 10,000 feet. When altitude reaches 20,000 feet, there is good surveillance coverage from existing radars except for a gap north of Araucaria/south of Yerbas Buenas radar. Additionally, there is a significant gap north of Cerro Divisadero/south of Puerto Montt at 10,000 feet. With ADS-B, these coverage gaps will be non-existent. Implementing ADS-B in the Puerto Montt ACC sector will significantly reduce these low altitude gaps for general aviation and in the terminal airport areas. Based on the analysis, excellent surveillance coverage with ADS-B will be realized at 3,000 feet and up providing increased benefits to pilots, ATC, and other end-users.

The team identified 45 locations as ADS-B locations. Twenty-eight of the locations are at non-established locations while 10 of the locations are existing radar locations and 7 are at airports. One of the main criteria used for the sitting of the ADS-B locations was elevation of the proposed location, which should be between 3,000 and 12,000 feet to provide good coverage, yet not be at elevations which would make maintenance more difficult.

Project Cost and Financing

The GBAS financial plan allows for gradual implementation of GBAS technologies and will enable a practical transition from the existing environment for airspace users and providers.

GBAS implementation of six systems is spread over four years from 2012 to 2015 years at six different airports (Santiago, Puerto Montt, Balmaceda, Concepcion, Punta Arenas and Isla Pascua). The total sum of cost for the acquisition is $17 million.

Including depot level maintenance, supply support, training and second level engineering support by the DGAC, the costs are estimated to be $19,392,327 which includes an estimated $70,000 - $85,000 yearly in-service cost.

For ADS-B, a two-segment Chile implementation strategy is proposed. Segment 1 consists of approximately 10 ADS-B sites in the Puerto Montt FIR as an operational trial. Based on experience in Segment 1, Segment 2 would expand ADS-B surveillance with approximately 38 additional sites to the remaining Santiago and Punta Arenas FIRs.

ADS-B Segment 1 starts in 2012 and goes to 2014. Segment 1 Acquisition costs are estimated to be $8,000,000 which, based on contract type, could be spread over 4 years. Acquisition plus in-service estimates raise the cost/budget to $9,530,025.

ADS-B Segment 2 starts in 2015 and goes to 2020 with acquisition costs to be at $30,500,000 which, again based on contract type, can be spread over the acquisition time frame. Including estimates for in-service costs raises the cost to approximately $35,000,000.